

A Special Section on Deep & Advanced Machine Learning Approaches for Human Behavior Analysis

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Increasingly, there have been attempts to utilize physiological information collected from different non-intrusive devices and sensors (e.g., electroencephalogram, electrocardiograph, electrodermal activity, and skin conductance) for different activities and studies, such as using the data to train machine-/deep-learning models in order to facilitate medical diagnosis and other decision-making. Given the constant advances in machine and deep learning methods, such as deep learning, transfer learning, reinforcement learning, and federated learning, we can also utilize such techniques in cognitive computing to facilitate human behavior analysis. For example, transfer learning uses data or knowledge acquired on solved problems to help solve unsolved but very relevant problems. Transfer learning is often used in cognitive computing to use differences between individuals or tasks to improve learning efficiency and effectiveness. Transfer learning can also be integrated with deep learning to take advantage of the progress of deep learning and transfer learning.

However, there are still many major challenges when using deep and machine learning algorithms to analyze human behavior. For example, deep and machine learning is used to learn the feature representation of human behavior from multimodal data; deep and machine learning is used to realize pattern mapping from one modal to another; deep and machine learning is used to realize the fusion of multiple modal data to achieve more high prediction accuracy; deep and machine learning is used to restore missing data in the modal, etc. Not surprisingly, several multimodal machine learning models have been developed in recent years, which have shown promising results when applied on applications such as multimedia descriptions and retrieval. Therefore, we posit the potential of leveraging such advances to address fundamental challenges in human behavior analysis.

In this thematic issue, we seek to provide a forum for researchers from cognitive computing and machine learning to present recent progress in deep and advanced machine learning research with applications to multimodal human behavior data. According to peer reviewers' review comments, this special issue contains a total of seven papers, and the authors have revised the papers based on the review comments [1-7]. This special issue has been possible by the strong support of Prof. James Jong Hyuk Park, the Editor-in-Chief of *Journal of Information Processing Systems* (JIPS). We would like to express our gratitude to the authors for their contributions.

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